WHAT IS CLAIMED IS:

1. A method of compressing video signals, the method comprising:
   a) transforming both a current frame and a reference frame using a wavelet transform having multiple levels, producing transformed image data;
   b) performing motion compensation to low-frequency band at a lowest level of the transformed image data producing motion-compensated, transformed image data;
   c) applying band or phase shifting methods to obtain an overcomplete expansion of the reference frame;
   d) performing motion compensation of high-frequency bands at the lowest level of the transformed image data using the overcomplete expansion;
   e) applying one-level inverse transform to the reference frame to produce a reconstructed image at a next resolution level;
   f) setting the next resolution level to be the lowest level; and
   g) repeating the above process the process reaches the highest resolution level.
2. The method of claim 1, wherein the multiple levels of wavelet transform is substantially equal to two.
3. The method of claim 1, wherein the method further comprises providing resolution scalability by performing motion estimation to a multi-resolution representation of video signals.
4. The method of claim 1, wherein the method further comprises providing rate scalability by embedded compression of motion-compensated prediction residues at different resolutions.
5. The method of claim 1, wherein performing motion estimation further comprises hierarchical motion estimation, wherein motion vectors estimated from a low band can be used as an initial estimate of motion vectors for high bands at a same level.
6. The method of claim 1, wherein the motion compensation method of high bands further comprises:
   a) using an overcomplete expansion of the reference frame operable to restore accuracy of a motion field;
   b) linearly interpolating in the wavelet domain operable to enhance accuracy of the motion field;
   c) combining the overcomplete expansion and the linear interpolation operable to enhance the accuracy of motion field in the wavelet domain.

7. The method of claim 3, wherein providing resolution scalability further comprises
   a) developing a non-expanding multi-resolution representation of video signals;
   b) performing motion estimation and compensation independently at different resolution levels;
   c) applying a hierarchical motion estimation technique designed for multi-resolution representation of video signals;
8. The method of claim 4, wherein providing rate scalability further comprises:
   a) offering an embedded bit stream by sequentially compressing coefficients from low resolution level to high resolution level; and
   b) offering an embedded bit stream by sequentially scanning bit planes of coefficients within each band.
9. The method of claim 5, wherein hierarchical motion estimation further comprises:
   a) using an estimated motion vector at a lower resolution level as an initial estimate reducing computations needed to search for an optimal motion vector at a higher resolution level;
   b) using the estimated motion vector at a lower resolution level as an initial estimate reducing a search range needed to find the optimal motion vector at a higher resolution level.
10. The method of claim 6, wherein using the overcomplete-expansion further comprises:
   a) Applying an inverse wavelet transform at a first level;
   b) shifting a reconstructed low band at a next level along vertical, horizontal and diagonal directions;
   c) applying forward wavelet transform;
   d) applying a direct linear time invariant phase shifting filter operable to obtain nonzero-phase wavelet coefficients from zero-phase coefficients; and
   e) applying a non-decimated wavelet transform to the reconstructed low-band signal;
11. The method of claim 6, wherein linearly interpolating further comprises:
   a) applying an inverse transform operable to obtain a reconstructed signal;
   b) linearly interpolating the reconstructed signal;
   c) applying a forward wavelet transform; and
   d) linearly interpolating transform coefficients directly in the wavelet domain;
12. A computer-readable medium including software code that, when executed, causes the computer to:

a) transform both a current frame and a reference frame using a wavelet transform having multiple levels, producing transformed image data;

b) perform motion compensation to low-frequency band at a lowest level of the transformed image data producing motion-compensated, transformed image data;

c) apply band or phase shifting methods to obtain an overcomplete expansion of the reference frame;

d) perform motion compensation of high-frequency bands at the lowest level of the transformed image data using the overcomplete expansion;

e) apply one-level inverse transform to the reference frame to produce a reconstructed image at a next resolution level;

f) set the next resolution level to be the lowest level; and

g) repeat the above process the process reaches the highest resolution level.

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